PATENT ABSTRACTS OF JAPAN

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(54) WHITE SYSTEM ORGANIC ELECTROLUMINESCENCE ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an organic EL element of white system which has a sufficient performance in the practicality such as emitting white system light, having high luminescence efficiency and having a long-life life.

SOLUTION: In an organic electroluminescence element which has a pair of electrodes and a luminescence medium layer sandwiched between the pair of electrodes, the white system organic electroluminescence element is characterized by the fact that the luminescence medium layer contains a blue system luminescent material and at least one of a fluorescence nature compound of fluoranthene skeleton, pentasene skeleton, or a perylene skeleton.

CLAIMS

[Claim(s)]

[Claim 1]An electrode of a couple.
A light-emitting medium layer pinched by inter-electrode [these].
It is the white system organic electroluminescence element provided with the above, and the above-mentioned light-emitting medium layer contains a fluorescent compound which has a blue system luminescent material, at least one fluoranthene skeleton, a pentacene skeleton, or a perylene skeleton.

[Claim 2]The white system organic electroluminescence element according to claim 1, wherein said light-emitting medium layer has the luminous layer A containing said blue system luminescent material and said fluorescent compound.
[Claim 3]The white system organic electroluminescence element according to claim 1, wherein said light-emitting medium layer consists of a blue system luminous layer and said luminous layer A.
[Claim 4]The white system organic electroluminescence element according to claim 1, wherein said light-emitting medium layer consists of the luminous layer B which consists of said blue system luminescent material, and a layer containing said fluorescent compound.
[Claim 5]The white system organic electroluminescence element according to claim 1, wherein said light-emitting medium layer consists of a blue system luminous layer and a layer containing said fluorescent compound.
[Claim 6]The white system organic electroluminescence element according to claim 2 or 3, wherein said luminous layer A consists of said blue system luminescent material and a blue fluorescence dopant.
[Claim 7]The white system organic electroluminescence element according to claim 4, wherein said luminous layer B consists of said blue system luminescent material and a blue fluorescence dopant.
[Claim 8]The white system organic electroluminescence element according to claim 3 or 5, wherein said blue system luminous layer consists of said blue system luminescent material and a blue fluorescence dopant.

[Claim 9]The white system organic electroluminescence element according to any one of claims 1 to 8, wherein said light-emitting medium layer contains a hole transporting material or hole-injection material.

[Claim 10]The white system organic electroluminescence element according to any one of claims 1 to 8, wherein said light-emitting medium layer has an electron hole transporting bed or a hole injection layer.

[Claim 11]The white system organic electroluminescence element according to any one of claims 1 to 8, wherein said light-emitting medium layer contains an electron transport material or electron injection material.

[Claim 12]The white system organic electroluminescence element according to any one of claims 1 to 8, wherein said light-emitting medium layer has an electron transport layer or an electronic injection layer.

[Claim 13]The white system organic electroluminescence element according to any one of claims 1 to 12, wherein said light-emitting medium layer which touches the anode contains an oxidizer.

[Claim 14]The white system organic electroluminescence element according to any one of claims 1 to 12, wherein said light-emitting medium layer which touches the negative pole contains a reducing agent.

[Claim 15]The white system organic electroluminescence element according to any one of claims 1 to 14 having an inorganic compound layer between at least one electrode and said light-emitting medium layer.

[Claim 16]The white system organic electroluminescence element according to any one of claims 1 to 15, wherein said blue system luminescent material is a styryl derivative, an anthracene derivative, or aromatic amine.

[Claim 17]The white system organic electroluminescence element according to claim 16, wherein said styryl derivative is at least one kind chosen from a JISUCHIRIRU derivative, a tris CHIRIRU derivative, a tetra styryl derivative, and a styryl amine derivative.

[Claim 18]The white system organic electroluminescence element according to claim 16, wherein said anthracene derivative is a compound which has a phenylanthracene skeleton.

[Claim 19]The white system organic electroluminescence element according to claim 16, wherein said aromatic amine is a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out.

[Claim 20]The white system organic electroluminescence element according to claim 16, wherein said aromatic amine is a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out, and has at least one alkenyl group.

[Claim 21]The white system organic electroluminescence element according to any one of claims 6 to 8, wherein said blue fluorescence dopant is at least one kind chosen from styryl amine, an amine substitution styryl compound, and a fused aromatic ring content compound.

[Claim 22]The white system organic electroluminescence element according to claim 1, wherein said fluorescent compound has an electron releasing group.

[Claim 23]The white system organic electroluminescence element according to claim 1, wherein said fluorescent compound shows fluorescence peak wavelength of 540-650 nm.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]About a white system organic electroluminescence element (electroluminescence is hereafter written as "EL".), in more detail, it is efficient and long lasting and this invention relates to the organic EL device with which white system luminescence is obtained.
[0002]
[Description of the Prior Art]Since it has the features, like it is excellent in shock resistance since the EL element using electroluminescence has high visibility and is a perfect solid state component because of self-luminescence, the use as a light emitting device in various displays attracts attention. There are an inorganic EL element which uses an inorganic compound for a luminescent material, and an organic EL device which uses an organic compound in this EL element, among these especially an organic EL device, Since impressed electromotive force can be substantially made low, and also a miniaturization is easy, power consumption is small, and surface light is possible and three-primary-colors luminescence is also easy, the utilization research is positively made as a next-generation light emitting device.
[0003]It is based on the composition of the anode / organic luminous layer / negative pole about the composition of this organic EL device, The thing of the composition of what formed suitably the hole-injection transporting bed and the electronic injection layer in this, for example, the anode / hole-injection transporting bed / organic luminous layer / negative pole, the anode / hole-injection transporting bed / organic luminous layer / electronic injection layer / negative pole, etc., etc. is known. These days, development of the organic EL device for a display is performed briskly, and it is concentrated on by development of the element which can carry out especially white light. It is because a display is equipped with a white system organic EL device and it can carry out the full color display of the light filter besides the use as lighting of a mono color display, a back light, etc. As an organic EL device of a white system, for example on U.S. Pat. No. 5503910 specifications. Make a light-emitting medium layer into the layered product of a blue light layer and a green emission layer, it is indicated by the element which added the red system fluorescent compound to this, and on U.S.

Pat. No. 5683828 specifications. The element which has the light-emitting medium layer which added the boron system complex which is a red system fluorescent compound to the blue-green luminous layer is indicated, and the element which holds the luminescent medium which added the benzo thioxanthene derivative which is a red system fluorescent compound to the blue-green luminous layer is indicated by JP,10-308278,A. However, an element given in a U.S. Pat. No. 5503910 specification, Although it is white light, luminous efficiency a life an element given in a U.S. Pat. No. 5683828 specification by 1 lumen/W grade for about 1000 hours, Although it is white light, and an element given in about 2.6 cd/A of luminous efficiency and JP,10-308278,A is white light, luminous efficiency does not fulfill practicality for 1 lumen/W grade, and luminous efficiency and a life enough.

[0004]

[Problem(s) to be Solved by the Invention]Under such a situation, the white light of this invention is carried out, its luminous efficiency is [5 lumens/more than W] as high as 5 or more cd/A, and it is aimed at providing the organic EL device of a white system which has sufficient performance in the practicality which is a long life of 10,000 hours or more.

[0005]

[Means for Solving the Problem]A result of having repeated research wholeheartedly in order that this invention persons might attain said purpose, A light-emitting medium layer A blue system luminescent material and at least one fluoranthene skeleton, It is efficient and long lasting, and an organic EL device which makes inter-electrode [of a couple] come to pinch a layer which contains a fluorescent compound which has a pentacene skeleton or a perylene skeleton, and contains this luminescent medium found out that white light was obtained. This invention is completed based on this knowledge.

[0006]Namely, this invention is an organic electroluminescence element characterized by comprising the following, What provides a white system organic EL device, wherein the above-mentioned light-emitting medium layer contains a fluorescent compound which has a blue system luminescent material, at least one fluoranthene skeleton, a pentacene skeleton, or a perylene skeleton.

An electrode of a couple.

A light-emitting medium layer pinched by inter-electrode [these].

[0007]

[Embodiment of the Invention]The organic EL devices of this invention are an electrode of a couple, and an element of the structure of having the light-emitting medium layer pinched by inter-electrode [these], as shown in drawing 1. The above-mentioned light-emitting medium layer contains the fluorescent compound which has a blue system luminescent material, at least one fluoranthene skeleton, a pentacene skeleton, or a perylene skeleton. A light-emitting medium layer is a medium which gives the electron, the transportation of an electron hole, and the place of recombination which mainly consist of organic compounds and are poured in from an electrode here, and it may consist of one layer, and may consist of two or more layers. In the case of two or more layers, a hole injection layer, an electron hole transporting bed, a luminous layer, an electron transport layer, etc. are

contained in a light-emitting medium layer.

[0008]In this invention, some lamination is employable.

(1) The first composition has the luminous layer A in which said light-emitting medium layer contains said blue system luminescent material and said fluorescent compound like drawing 1. The light-emitting medium layer may consist of a blue system luminous layer and said luminous layer A. At this time, the light-emitting medium layer may be formed from organic layers other than the luminous layer A and the luminous layer A. For example, as shown in drawing 2, the case where it has laminated with charge transport layers (a hole injection layer, an electron hole transporting bed, an electron transport layer, etc.) is mentioned. The laminating order of a charge transport layer / luminous layer A may be reversed among drawing 2. Various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. Said luminous layer A consists of said blue system luminescent material and a blue fluorescence dopant, and/or it is still more desirable when said blue system luminous layer consists of said blue system luminescent material and a blue fluorescence dopant.

[0009](2) As the second composition is shown in drawing 3, said light-emitting medium layer consists of the luminous layer B which consists of said blue system luminescent material, and a layer containing said fluorescent compound. The laminating order of a fluorescent compound contained layer / luminous layer B may be reversed among drawing 3. Between a fluorescent compound contained layer or the luminous layer B, and electrodes and various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. one especially desirable with this composition -- the luminous layer B -- a blue system -- it is a luminous layer and is a case of the yellow and orange which a fluorescent compound contained layer becomes from a luminescent material and a fluorescent compound, or a red light layer -- a blue system -- a luminous layer -- a blue system -- a luminescent material and a blue system -- it is consisting of a dopant of luminescence. As a luminescent material contained in said fluorescent compound contained layer, blue light material or green emission material is preferred.

[0010](3) The third composition consists of a blue system luminous layer and said fluorescent compound layer, as shown in drawing 4. The laminating order of a fluorescent compound layer / blue system luminous layer may be reversed among drawing 4. Between a fluorescence compound layer and a blue system luminous layer, and electrodes and various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. Here, a fluorescent compound is the layer contained 20 to 100% of the weight, and a fluorescent compound layer is a layer which emits light in yellow, orange, or red. It is especially desirable with such composition that a luminous layer is a blue system luminous layer, and a fluorescent compound layer is the yellow, ****, or the red light layer which consists of fluorescent compounds. It is desirable that a blue system luminous layer consists of said blue system luminescent material and a blue

fluorescence dopant. As a luminescent material contained in said fluorescent compound layer, blue light material or green emission material is preferred.

[0011]As mentioned above, in the first - the composition of three, the luminous layer A, the luminous layer B, and a blue system luminous layer may consist of said blue system luminescent material and a blue fluorescence dopant, and may improve blue light performance. It is a compound of the blue fluorescence added in order that a blue fluorescence dopant may improve the performance of a luminous layer, and styryl amine, an amine substitution styryl compound, and a fused aromatic ring content compound are mentioned as a desirable example. As the addition, it is 0.1 to 20 % of the weight. When it is smaller than the ionization energy of the main ingredients, since electric charge pouring nature of ionization energy of a blue fluorescence dopant improves, it is preferred.

[0012]Said light-emitting medium layer may contain a hole transporting material or hole-injection material. Said light-emitting medium layer may have an electron hole transporting bed or a hole injection layer. Said light-emitting medium layer may contain an electron transport material or electron injection material. Said light-emitting medium layer may have an electron transport layer or an electronic injection layer.

[0013]When said light-emitting medium layer which touches the anode contains an oxidizer, it is preferred. The oxidizer with a preferred oxidizer contained in the light-emitting medium layer is electronic suction nature or an electronic acceptor. They are the salts preferably formed with a Lewis acid, various quinone derivative, and dicyanoquinodimethane derivative, and aromatic amine and Lewis acid. Desirable Lewis acid is ferric chloride, an antimony chloride, chloridation aluminum, etc. It is desirable when the organic luminescent medium which touches the negative pole contains a reducing agent at least. A desirable reducing agent is a complex formed with an alkaline metal, alkaline-earth metals, an alkali metal oxide, an alkaline earth oxide, a rare earth oxide, alkali metal halides, an alkaline earth halogenide, a rare earth halogenide, and an alkaline metal and aromatic compounds. Especially desirable alkaline metals are Cs, Li, Na, and K.

[0014]It may have an inorganic compound layer between at least one electrode and said light-emitting medium layer. As a desirable inorganic compound used for an inorganic compound layer, an alkali metal oxide, an alkaline earth oxide, a rare earth oxide, alkali metal halides, an alkaline earth halogenide, a rare earth halogenide, SiO_X, AlO_X, SiN. They are various oxides, such as $_X$, SiON, AlON, GeO_X, LiO_X, LiON, TiO_X, TiON, TaO_X, TaON, TaN_X, and C, a nitride, and an oxidation nitride. As an ingredient of the layer which touches especially the anode, SiO_X, AlO_X, SiN_X, SiON, AlON, GeO_X, and C form a stable pouring volume phase, and are preferred. As an ingredient of the layer which touches especially the negative pole, LiF, MgF_2, CaF_2, MgF_2, and NaF are preferred.

[0015]As a fluorescent compound which is used by this invention and which has at least one fluoranthene skeleton or a perylene skeleton, it is a following general formula, for example. [1'] **[2'] It reaches. [1]-The compound shown by [18] is mentioned.

X=Z=Y General formula [1']

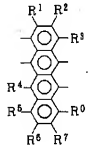
X=W General formula [2']

The inside of [type and Z are following general formula (1) - (6).

[0016]

[Formula 1]

(1)



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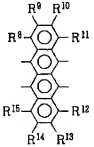

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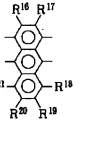

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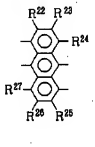

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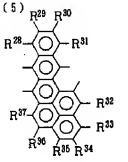

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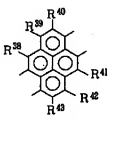


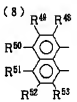
[0017]The tetravalent basis which it is in ********, and X and Y are following general formula (7) - (10) independently, respectively.

[0018]

[Formula 2]

(7)

(8)



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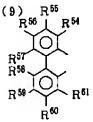

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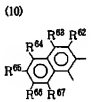
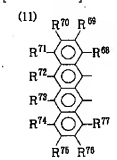


[0019]The divalent basis which it is in ********, and W are following general formula (11) - (13).

[0020]

[Formula 3]

(11)



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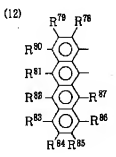

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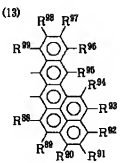
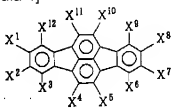


It is a divalent basis which it is in ********.

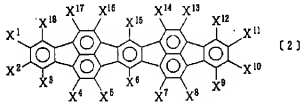
[0021]The above-mentioned general formula (1) In - (13), R^0 - R^{99}, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, substitution, or], An alkoxy group with 1-20 carbon atoms which are not replaced [a cycloalkyl group with 6-10 carbon atoms which are not replaced / substitution or /, substitution or], An aryloxy group with 6-20 carbon atoms which are not replaced [an amino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution or], An alkoxycarbonyl group with 1-20 carbon atoms which are not replaced [substitution or], R^0 which is a heterocycle group with 5-30 carbon atoms which are not replaced [an aromatic hydrocarbon group with 6-30 carbon atoms which are not replaced / an aralkyl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or /, substitution, or], and adjoins - R^{99} may form cyclic structure unitedly.]

[0022]

[Formula 4]



[1]



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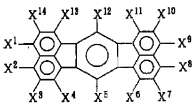

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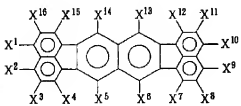

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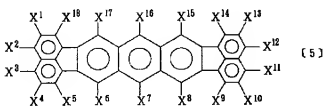
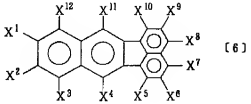


[5]

[0023]

[Formula 5]



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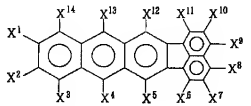

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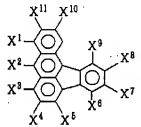

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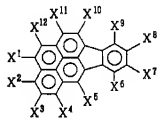
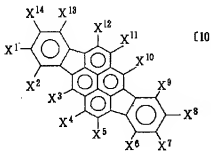


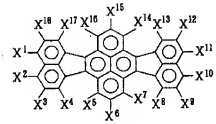
[9]

[0024]

[Formula 6]



[10]



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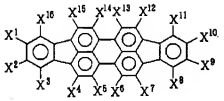

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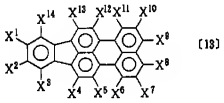
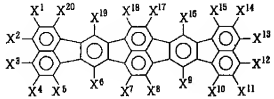


[13]

[0025]
[Formula 7]



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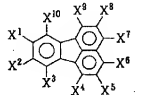
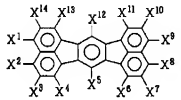
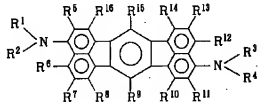


[15]

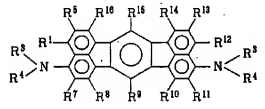


[16]

[0026][General formula [1]-[16]Independently X^1 - X^{20} among a formula, respectively A hydrogen atom, An alkyl group with a straight chain, branching, or 1-20 annular carbon atoms, a straight chain, An aryl group with 6-30 carbon atoms which are not replaced [an alkoxy group with branching or 1-20 annular carbon atoms, substitution or], An arylamino group with 6-30 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with an aryl alkylamino group with 7-30 carbon atoms which are not replaced [an alkylamino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution, or], substitution, or 8-30 unreplaced carbon atoms, An adjoining substituent and X^1 - X^{20} may form cyclic structure unitedly. A substituent may be the same when the adjoining substituent is an aryl group.]
General formula[1]-[16]When a compound of a formula contains an amino group or an alkenyl group, it is preferred.
[0027]
[Formula 8]



[17]

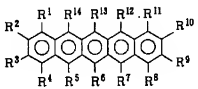


[18]

[0028][General formula [17]-[18]Independently R^1 - R^4 among a formula, respectively An alkyl group with 1-20 carbon atoms, It is an aryl group with 6-30 carbon atoms which are not replaced [substitution or], and R^1, R^2 and/or R^3, and R^4 may be combined via carbon-carbon bonding or -O-, and -S-. R^5 - R^{16} A hydrogen atom, a straight chain, branching, or an alkyl group with 1-20 annular carbon atoms, An aryl group with 6-30 carbon atoms which are not replaced [an alkoxy group with a straight chain, branching, or 1-20 annular carbon atoms, substitution, or], An arylamino group with 6-30 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with an aryl alkylamino group with 7-30 carbon atoms which are not replaced [an alkylamino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution, or], substitution, or 8-30 unreplaced carbon atoms, An adjoining substituent and R^5 - R^{16} may form cyclic structure unitedly. It is desirable when at least one of substituent R^5 in each formula - the R^{16} contains amine or an alkenyl group.]

[0029]As a fluorescent compound which is used by this invention and which has at least one pentacene skeleton, it is a following general formula, for example. [19]-A compound shown by [20] is mentioned.

[Formula 9]



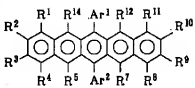
[19]

[General formula [19]Inside R^1 - R^{14} independently, respectively A hydrogen atom, An alkyl group with 1-10 carbon atoms, an aryloxy group with 6-20 carbon atoms, It is an arylated alkyl group with 6-20 carbon atoms, an aryl group with 6-30 carbon atoms, an arylamino group with 6-30 carbon atoms, an alkylamino group with 2-20 carbon atoms, or an aryl alkylamino group with 6-30 carbon atoms, and may be replaced. At least 1 set which R^1 - R^{14} furthermore adjoin mutually is except a hydrogen

atom, and forms cyclic structure.]

[0030]

[Formula 10]



[20]

[General formula [20]Inside R^{15} - R^{26} independently, respectively A hydrogen atom, An alkyl group with 1-10 carbon atoms, an aryloxy group with 6-20 carbon atoms, It is an arylated alkyl group with 6-20 carbon atoms, an aryl group with 6-30 carbon atoms, an arylamino group with 6-30 carbon atoms, an alkylamino group with 2-20 carbon atoms, or an aryl alkylamino group with 6-30 carbon atoms, and may be replaced. At least 1 set which R^{15} - R^{26} furthermore adjoin mutually is except a hydrogen atom, and forms cyclic structure. Ar^1 and Ar^2 are heterocycle groups with 5-30 carbon atoms which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or].]

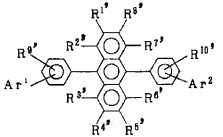
[0031]As for a fluorescent compound which has a fluoranthene skeleton or a perylene skeleton, in order efficient and to acquire a long life, it is preferred to contain an electron releasing group, and a desirable electron releasing group is an arylamino group which is not replaced [substitution or]. As for a fluorescent compound which has a fluoranthene skeleton, a perylene skeleton, or a pentacene skeleton, five or more are preferred in the number of condensed rings, and six especially or more are preferred. This is because a fluorescent compound shows fluorescence peak wavelength of 540-650 nm, luminescence from a fluorescent compound laps with a blue system luminescent material and it assumes white. When said fluorescent compound carries out two or more owners of a fluoranthene skeleton or the perylene skeleton, since the luminescent color serves as a red spectrum region from yellow, it is preferred. Especially a desirable fluorescent compound has an electron releasing group, a fluoranthene skeleton, or a perylene skeleton, and shows fluorescence peak wavelength of 540-650 nm.

[0032]As for said blue system luminescent material used by this invention, it is preferred that they are a styryl derivative, an anthracene derivative, or aromatic amine. It is preferred that said styryl derivative is at least one kind chosen from a JISUCHIRIRU derivative, a tris CHIRIRU derivative, a tetra styryl derivative, and a styryl amine derivative. It is preferred that said anthracene derivative is a compound which has a phenylanthracene skeleton. It is preferred that said aromatic amine is a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out. This aromatic amine is still more preferred in it being a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out, and has at least one alkenyl group.

[0033]As the above-mentioned styryl derivative and an anthracene derivative, it is a following general formula, for example. [i]-[v] A compound shown is a following general formula as the above-

mentioned aromatic amine, for example. [vi]-[vii] A compound shown is mentioned. General formula[i]

[Formula 11]

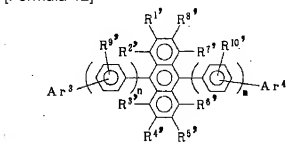


[i]

[0034][$R^{1'}$ - $R^{10'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^1 and Ar^2 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 7-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or].]

[0035]General formula[ii]

[Formula 12]

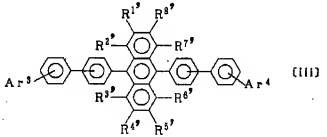


[ii]

[0036][$R^{1'}$ - $R^{10'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^3 and Ar^4 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 7-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with 4-40 carbon atoms which are not replaced [a heterocycle group with 5-30 carbon atoms which are not replaced / a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or /, substitution, or]. 1-3m of n are 1-3, and n+m>=2.]

[0037]General formula[iii]

[Formula 13]



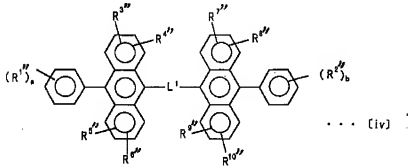
(III)

[0038][$R^{1'}$ - $R^{8'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^3 and

Ar^4 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 6-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with 4-40 carbon atoms which are not replaced [a heterocycle group with 5-30 carbon atoms which are not replaced / a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or /, substitution, or].]

[0039]General formula[iv]

[Formula 14]

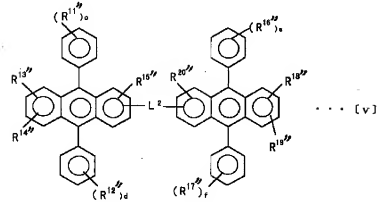


... (iv)

[0040][R^{1}"- R^{10}" among a formula, A hydrogen atom, an alkenyl group, an alkyl group, a cycloalkyl group, the aryl group that may be replaced, an alkoxyl group, an aryloxy group, an alkylamino group, an arylamino group, or the heterocyclic group that may be replaced is shown independently, respectively, a and b show the integer of 1-5, respectively, and when they are two or more, R^{1}"comrades or R^{2}". In each, it may be the same or may differ, and R^{1}"comrades or R^{2}" may join together, may form the ring, and, R^{3} -- ", R^{4}", and R^{5} -- ", R^{6}", and R^{7} -- ", R^{8}", and R^{9}"and R^{10}" may combine with it being, and may form the ring. L^{1} shows a single bond or -O-, -S-, -N(R)- (R is an alkyl group or an aryl group which may be replaced), or an allylene group. The anthracene derivative expressed with], or a general formula [v]

[0041]

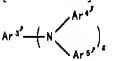
[Formula 15]



[0042][R^{11}"- R^{20}" among a formula, A hydrogen atom, an alkenyl group, an alkyl group, a cycloalkyl group, an aryl group, an alkoxyl group, an aryloxy group, an alkylamino group, an arylamino group, or two or more cyclic group that may be replaced is shown independently, respectively, In [when c, d, e, and f show the integer of 1-5, respectively and they are two or more] each R^{11}"comrades and R^{12}' comrades and R^{16}' comrades or R^{17}", It may be the same or may differ, and R^{11}"comrades and R^{12}' comrades and R^{16}' comrades or R^{17}" may join together, may form the ring, and, R^{13}", R^{14}", and R^{18}"and R^{19}" may combine with it being, and may form the ring. L^2 shows a single bond or -O-, -S-, -N(R)- (R is an alkyl group or an aryl group which may be replaced), or an allylene group.]

[0043]General formula[vi]

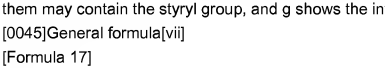
[Formula 16]



[0044][Ar^3', Ar^4', and Ar^5' show independently the aromatic group of the monovalence which is not replaced [substitution with 6-40 carbon atoms, or] among a formula, respectively, at least one in them may contain the styryl group, and g shows the integer of 1-4.]

[0045]General formula[vii]

[Formula 17]

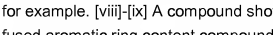


[0046][-- a formula -- inside -- Ar -- ^{6} -- ' -- Ar -- ^{7} -- ' -- Ar -- ^{9} -- ' -- Ar -- ^{11} -- ' -- and -- Ar -- ^{12} -- '. The aromatic group of the monovalence which is not replaced [substitution with 6-40 carbon atoms or] is shown independently, respectively, and Ar^8' and Ar^{10}' The aromatic group of the bivalence which is not replaced [substitution with 6-40 carbon atoms or] is shown independently, respectively, at least one of A^6' - the Ar^{12}' may contain the styryl group or the Styr Wren group, and h and k are the integers of 0-2, respectively.]

[0047]It is preferred that said blue fluorescence dopant is at least one kind chosen from styryl amine, an amine substitution styryl compound, and a fused aromatic ring content compound. As the above-mentioned styryl amine and an amine substitution styryl compound, it is a following general formula, for example. [viii]-[ix] A compound shown is a following general formula as the above-mentioned fused aromatic ring content compound, for example. [x] A compound shown is mentioned.

[0048]General formula[viii]

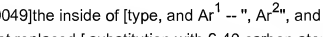
[Formula 18]



[0049]the inside of [type, and Ar^1 -- ", Ar^2", and Ar^3" show independently the aromatic group which is not replaced [substitution with 6-40 carbon atoms or], respectively, and, as for at least one in them, n shows the integer of 1-3 including a styryl group.]

[0050]General formula[ix]

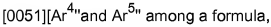
[Formula 19]



[0051][Ar^4"and Ar^5" among a formula, Independently, an allylene group, E^1, and E^2 with 6-30 carbon atoms show an aryl group or an alkyl group, a hydrogen atom, or a cyano group with 6-30 carbon atoms independently, respectively, and q shows an integer of 1-3, respectively. U and/or V are the substituents containing an amino group, and are preferred in this amino group being an arylamino group.]

[0052]General formula[x]

[Formula 20]



[0053][A among a formula An alkyl group or an alkoxy group with 1-16 carbon atoms, The arylamino group which is not replaced [substitution with the alkylamino group which is not replaced / substitution with the aryl group which is not replaced / substitution with 6-30 carbon atoms or / and 6-30 carbon atoms or / or 6-30 carbon atoms or] and B show a fused aromatic ring group with 10-40 carbon atoms, and r shows the integer of 1-4.]

[0054]

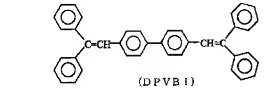
[Example]Next, although an example explains this invention still in detail, this invention is not limited at all by these examples.

Production of example 1 organic EL device (the first example of composition: fluoranthene skeleton) glass substrate with an ITO (In-Sn-O) transparent electrode (made by a JIOMA tick company) of 75 mm x 25 mmx1.1-mm thickness UV ozone wash after performing ultrasonic cleaning for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of a vacuum

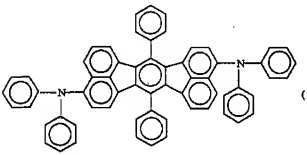
evaporator is equipped with the glass substrate with a transparent electrode line after washing, On the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, the N,N'-bis(N,N'-diphenyl-4-aminophenyl)-N,N-diphenyl-4,4'-diamino-1,1'-biphenyl film (TPD232 film) of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, it is a 4,4'-screw [N-(1-naphthyl) -N-phenylamino] of 20 nm of thickness on TPD232 film. The biphenyl film (NPD film) was formed. This NPD film functions as an electron hole transporting bed. They are the styryl derivative DPVBi of 40 nm of thickness, and the following fluorescent compound (E1, fluorescence-peak wavelength: 565 nm) on a NPD film.

[0055]

[Formula 21]



(DPVBi)



(E1)

[0056]Membranes were vapor-deposited and formed by the weight ratio of 40:0.04. This film functions as a white light layer. It is tris (eight quinolinol) of 20 nm of thickness on this film. The aluminum film (Alq film) was formed. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 181 cd/m^2, maximum light-emitting-luminance 110000 cd/m^2, and luminous efficiency 8.8 cd/A was obtained. It is also as a chromaticity coordinate (0.36-0.32), and has checked with white light. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1800 hours.

[0057]production (the second example of composition: fluoranthene skeleton) of example 2 organic EL device

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum

evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. At this time, the above-mentioned fluorescent compound (E1) was simultaneously produced by the weight ratio of 20:0.1. This NPD film functions as a luminous layer of the yellow-orange color of electron hole transportability. DPVBi of 40 nm of thickness was produced as a blue light layer, and the Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 151 cd/m^2, maximum light-emitting-luminance 80000 cd/m^2, and luminous efficiency 6.8 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1100 hours.

[0058]Production of example 3 organic EL device (the third example of composition: fluoranthene skeleton)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. This NPD film functions as an electron hole transporting bed. On the NPD film, the above-mentioned fluorescent compound (E1) of 3 nm of thickness was vapor-deposited, and membranes were formed. This film functions as a fluorescent compound layer, and emits light in orange. On this film, the styryl derivative DPVBi of 40 nm of thickness was vapor-deposited, and membranes were formed. This film functions as a blue light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 131 cd/m^2, maximum light-emitting-luminance 60000 cd/m^2, and luminous efficiency 5.8

cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1400 hours.

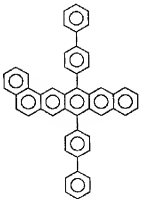
[0059]Production of example 4 organic EL device (example which added the hole transporting material to the luminous layer)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. This NPD film functions as an electron hole transporting bed. Mixed vacuum evaporation of the styryl derivative DPVBi was carried out by the weight ratio of 20:20:0.04 as NPD and a blue light material as the above-mentioned fluorescent compound (E1) and a hole transporting material, and the film was produced. This film functions as a white light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 131 cd/m^2, maximum light-emitting-luminance 120000 cd/m^2, and luminous efficiency 8.0 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 2000 hours.

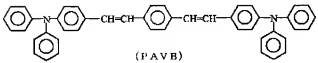
[0060]Production of example 5 organic EL device (the first example of composition: pentacene skeleton)

In Example 1, they are the following PAVB and the following fluorescent compound (F1, fluorescence-peak wavelength: 595 nm) on a NPD film as the styryl derivative DPVBi of 40 nm of thickness, and a blue fluorescence dopant.

[Formula 22]



(F1)



(PAVB)

[0061]Except for having vapor-deposited and formed membranes by the weight ratio of 40:1:0.05, the organic EL device was formed similarly. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 6V was impressed, the white light of light-emitting-luminance 319 cd/m^2, maximum light-emitting-luminance 100000 cd/m^2, and luminous efficiency 7.28 cd/A was obtained. It is also as a chromaticity coordinate (0.33-0.34), and has checked with white light. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was very as long-life as 3500 hours.

[0062]Production of example 6 organic EL device (the second example of composition: pentacene skeleton)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. On this NPD film, the styryl derivative DPVBi of 2 nm of thickness and the fluorescent compound (F1) were vapor-deposited by the weight ratio of 2:0.026, and membranes were formed. This film functions as an orange-light-emitting layer. On this film, PAVB was vapor-deposited by the weight ratio of 38:1 as the styryl derivative DPVBi of 38 nm of thickness, and a blue fluorescence dopant, and membranes were formed. This film functions as a blue light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance

was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5.5V was impressed, the white light of light-emitting-luminance 233 cd/m^2, maximum light-emitting-luminance 80000 cd/m^2, and luminous efficiency 6.85 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 2100 hours.

[0063]In comparative example 1 Example 1, the organic EL device was similarly formed instead of the fluorescent compound (E1) except for having used conventionally the rubrene used as an orange fluorescent compound. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 6V was impressed, the white light of light-emitting-luminance 140 cd/m^2, maximum light-emitting-luminance 60000 cd/m^2, and luminous efficiency 4.0 cd/A was obtained. Thus, compared with the example, luminous efficiency was substantially inferior. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as short-life as 560 hours.

[0064]

[Effect of the Invention]As explained to details above, the white light of the organic EL device of this invention is carried out, luminous efficiency is as high as 5 or more cd/A, and 5 lumens/more than W has sufficient performance in the practicality which is a long life of 10,000 hours or more by anticipated use. For this reason, this organic EL device is suitably used as a light emitting device of various displays.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]About a white system organic electroluminescence element (electroluminescence is hereafter written as "EL".), in more detail, it is efficient and long lasting and this invention relates to the organic EL device with which white system luminescence is obtained.
[0002]

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art]Since it has the features, like it is excellent in shock resistance since the EL element using electroluminescence has high visibility and is a perfect solid state component because of self-luminescence, the use as a light emitting device in various displays attracts attention. There are an inorganic EL element which uses an inorganic compound for a luminescent material, and an organic EL device which uses an organic compound in this EL element, among these especially an organic EL device, Since impressed electromotive force can be substantially made low, and also a miniaturization is easy, power consumption is small, and surface light is possible and three-primary-colors luminescence is also easy, the utilization research is positively made as a next-generation light emitting device.
[0003]It is based on the composition of the anode / organic luminous layer / negative pole about the composition of this organic EL device, The thing of the composition of what formed suitably the hole-injection transporting bed and the electronic injection layer in this, for example, the anode / hole-injection transporting bed / organic luminous layer / negative pole, the anode / hole-injection transporting bed / organic luminous layer / electronic injection layer / negative pole, etc., etc. is known. These days, development of the organic EL device for a display is performed briskly, and it is concentrated on by development of the element which can carry out especially white light. It is because a display is equipped with a white system organic EL device and it can carry out the full color display of the light filter besides the use as lighting of a mono color display, a back light, etc. As an organic EL device of a white system, for example on U.S. Pat. No. 5503910 specifications. Make a light-emitting medium layer into the layered product of a blue light layer and a green emission layer, it is indicated by the element which added the red system fluorescent compound to this, and on U.S. Pat. No. 5683828 specifications. The element which has the light-emitting medium layer which added the boron system complex which is a red system fluorescent compound to the blue-green luminous layer is indicated, and the element which holds the luminescent medium which added the benzo thioxanthene derivative which is a red system fluorescent compound to the blue-green luminous layer is indicated by JP,10-308278,A. However, an element given in a U.S. Pat. No. 5503910 specification, Although it is white light, luminous efficiency a life an element given in a U.S. Pat. No. 5683828

specification by 1 lumen/W grade for about 1000 hours, Although it is white light, and an element given in about 2.6 cd/A of luminous efficiency and JP,10-308278,A is white light, luminous efficiency does not fulfill practicality for 1 lumen/W grade, and luminous efficiency and a life enough.

[Translation done.]

* NOTICES *

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained to details above, the white light of the organic EL device of this invention is carried out, luminous efficiency is as high as 5 or more cd/A, and 5 lumens/more than W has sufficient performance in the practicality which is a long life of 10,000 hours or more by anticipated use. For this reason, this organic EL device is suitably used as a light emitting device of various displays.

[Translation done.]

* NOTICES *

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Under such a situation, the white light of this invention is carried out, its luminous efficiency is [5 lumens/more than W] as high as 5 or more cd/A, and it is aimed at providing the organic EL device of a white system which has sufficient performance in the practicality which is a long life of 10,000 hours or more.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem]A result of having repeated research wholeheartedly in order that this invention persons might attain said purpose, A light-emitting medium layer A blue system luminescent material and at least one fluoranthene skeleton, It is efficient and long lasting, and an organic EL device which makes inter-electrode [of a couple] come to pinch a layer which contains a fluorescent compound which has a pentacene skeleton or a perylene skeleton, and contains this luminescent medium found out that white light was obtained. This invention is completed based on this knowledge.
[0006]Namely, this invention is an organic electroluminescence element characterized by comprising the following, What provides a white system organic EL device, wherein the above-mentioned light-emitting medium layer contains a fluorescent compound which has a blue system luminescent material, at least one fluoranthene skeleton, a pentacene skeleton, or a perylene skeleton.
An electrode of a couple.
A light-emitting medium layer pinched by inter-electrode [these].

[0007]
[Embodiment of the Invention]The organic EL devices of this invention are an electrode of a couple, and an element of the structure of having the light-emitting medium layer pinched by inter-electrode [these], as shown in drawing 1. The above-mentioned light-emitting medium layer contains the fluorescent compound which has a blue system luminescent material, at least one fluoranthene skeleton, a pentacene skeleton, or a perylene skeleton. A light-emitting medium layer is a medium which gives the electron, the transportation of an electron hole, and the place of recombination which mainly consist of organic compounds and are poured in from an electrode here, and it may consist of one layer, and may consist of two or more layers. In the case of two or more layers, a hole injection layer, an electron hole transporting bed, a luminous layer, an electron transport layer, etc. are contained in a light-emitting medium layer.
[0008]In this invention, some lamination is employable.
(1) The first composition has the luminous layer A in which said light-emitting medium layer contains

said blue system luminescent material and said fluorescent compound like drawing 1. The light-emitting medium layer may consist of a blue system luminous layer and said luminous layer A. At this time, the light-emitting medium layer may be formed from organic layers other than the luminous layer A and the luminous layer A. For example, as shown in drawing 2, the case where it has laminated with charge transport layers (a hole injection layer, an electron hole transporting bed, an electron transport layer, etc.) is mentioned. The laminating order of a charge transport layer / luminous layer A may be reversed among drawing 2. Various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. Said luminous layer A consists of said blue system luminescent material and a blue fluorescence dopant, and/or it is still more desirable when said blue system luminous layer consists of said blue system luminescent material and a blue fluorescence dopant.

[0009](2) As the second composition is shown in drawing 3, said light-emitting medium layer consists of the luminous layer B which consists of said blue system luminescent material, and a layer containing said fluorescent compound. The laminating order of a fluorescent compound contained layer / luminous layer B may be reversed among drawing 3. Between a fluorescent compound contained layer or the luminous layer B, and electrodes and various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. one especially desirable with this composition -- the luminous layer B -- a blue system -- it is a luminous layer and is a case of the yellow and orange which a fluorescent compound contained layer becomes from a luminescent material and a fluorescent compound, or a red light layer -- a blue system -- a luminous layer -- a blue system -- a luminescent material and a blue system -- it is consisting of a dopant of luminescence. As a luminescent material contained in said fluorescent compound contained layer, blue light material or green emission material is preferred.

[0010](3) The third composition consists of a blue system luminous layer and said fluorescent compound layer, as shown in drawing 4. The laminating order of a fluorescent compound layer / blue system luminous layer may be reversed among drawing 4. Between a fluorescence compound layer and a blue system luminous layer, and electrodes and various kinds of layers other than a charge transport layer, such as an electron barrier layer, a hole barrier layer, an organic semiconductor layer, an inorganic semiconductor layer, and an adhesion improvement layer, may be inserted. Here, a fluorescent compound is the layer contained 20 to 100% of the weight, and a fluorescent compound layer is a layer which emits light in yellow, orange, or red. It is especially desirable with such composition that a luminous layer is a blue system luminous layer, and a fluorescent compound layer is the yellow, ****, or the red light layer which consists of fluorescent compounds. It is desirable that a blue system luminous layer consists of said blue system luminescent material and a blue fluorescence dopant. As a luminescent material contained in said fluorescent compound layer, blue light material or green emission material is preferred.

[0011]As mentioned above, in the first - the composition of three, the luminous layer A, the luminous

layer B, and a blue system luminous layer may consist of said blue system luminescent material and a blue fluorescence dopant, and may improve blue light performance. It is a compound of the blue fluorescence added in order that a blue fluorescence dopant may improve the performance of a luminous layer, and styryl amine, an amine substitution styryl compound, and a fused aromatic ring content compound are mentioned as a desirable example. As the addition, it is 0.1 to 20 % of the weight. When it is smaller than the ionization energy of the main ingredients, since electric charge pouring nature of ionization energy of a blue fluorescence dopant improves, it is preferred.

[0012]Said light-emitting medium layer may contain a hole transporting material or hole-injection material. Said light-emitting medium layer may have an electron hole transporting bed or a hole injection layer. Said light-emitting medium layer may contain an electron transport material or electron injection material. Said light-emitting medium layer may have an electron transport layer or an electronic injection layer.

[0013]When said light-emitting medium layer which touches the anode contains an oxidizer, it is preferred. The oxidizer with a preferred oxidizer contained in the light-emitting medium layer is electronic suction nature or an electronic acceptor. They are the salts preferably formed with a Lewis acid, various quinone derivative, and dicyanoquinodimethane derivative, and aromatic amine and Lewis acid. Desirable Lewis acid is ferric chloride, an antimony chloride, chloridation aluminum, etc. It is desirable when the organic luminescent medium which touches the negative pole contains a reducing agent at least. A desirable reducing agent is a complex formed with an alkaline metal, alkaline-earth metals, an alkali metal oxide, an alkaline earth oxide, a rare earth oxide, alkali metal halides, an alkaline earth halogenide, a rare earth halogenide, and an alkaline metal and aromatic compounds. Especially desirable alkaline metals are Cs, Li, Na, and K.

[0014]It may have an inorganic compound layer between at least one electrode and said light-emitting medium layer. As a desirable inorganic compound used for an inorganic compound layer, an alkali metal oxide, an alkaline earth oxide, a rare earth oxide, alkali metal halides, an alkaline earth halogenide, a rare earth halogenide, SiO_X, AlO_X, SiN. They are various oxides, such as $_X$, SiON, AlON, GeO_X, LiO_X, LiON, TiO_X, TiON, TaO_X, TaON, TaN_X, and C, a nitride, and an oxidation nitride. As an ingredient of the layer which touches especially the anode, SiO_X, AlO_X, SiN_X, SiON, AlON, GeO_X, and C form a stable pouring volume phase, and are preferred. As an ingredient of the layer which touches especially the negative pole, LiF, MgF_2, CaF_2, MgF_2, and NaF are preferred.

[0015]As a fluorescent compound which is used by this invention and which has at least one fluoranthene skeleton or a perylene skeleton, it is a following general formula, for example. [1'] **[2'] It reaches. [1]-The compound shown by [18] is mentioned.

X=Z=Y General formula [1']

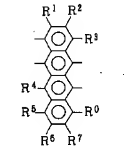
X=W General formula [2']

The inside of [type and Z are following general formula (1) - (6).

[0016]

[Formula 1]

(1)



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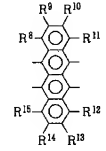

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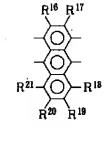

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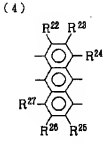

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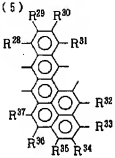

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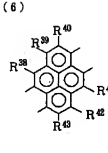
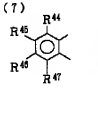


[0017]The tetravalent basis which it is in ********, and X and Y are following general formula (7) - (10) independently, respectively.

[0018]

[Formula 2]

(7)



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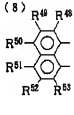

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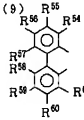

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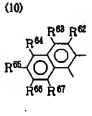
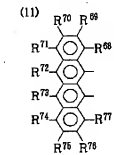


[0019]The divalent basis which it is in ********, and W are following general formula (11) - (13).

[0020]

[Formula 3]

(11)



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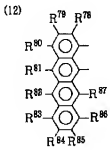

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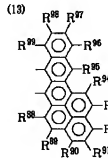


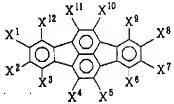
It is a divalent basis which it is in ********.

[0021]The above-mentioned general formula (1) In - (13), R^0 - R^{99}, Independently, respectively An

alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, substitution, or], An alkoxy group with 1-20 carbon atoms which are not replaced [a cycloalkyl group with 6-10 carbon atoms which are not replaced / substitution or /, substitution or], An aryloxy group with 6-20 carbon atoms which are not replaced [an amino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution or], An alkoxycarbonyl group with 1-20 carbon atoms which are not replaced [substitution or], R^0 which is a heterocycle group with 5-30 carbon atoms which are not replaced [an aromatic hydrocarbon group with 6-30 carbon atoms which are not replaced / an aralkyl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or /, substitution, or], and adjoins - R^{99} may form cyclic structure unitedly.]

[0022]

[Formula 4]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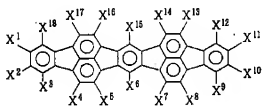
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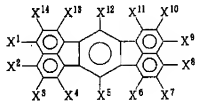
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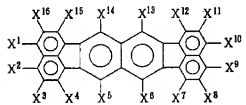
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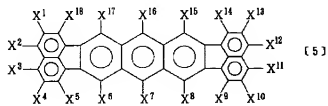
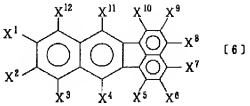
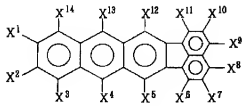

[5]

[0023]

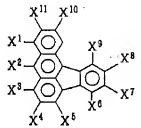
[Formula 5]



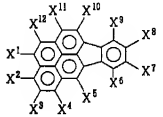
[6]



[7]

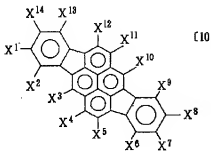


[8]

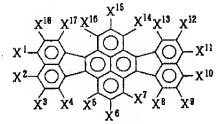


[9]

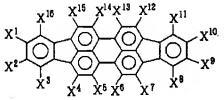
[0024]
[Formula 6]



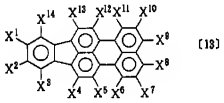
[10]



[11]

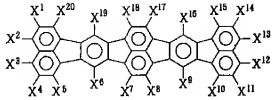


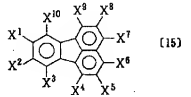
[12]

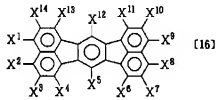


[13]

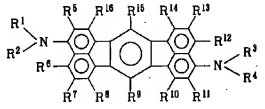
[0025]
[Formula 7]


[14]

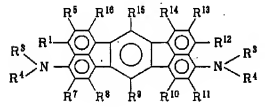

[15]


[16]

[0026][General formula [1]-[16]Independently X^1 - X^{20} among a formula, respectively A hydrogen atom, An alkyl group with a straight chain, branching, or 1-20 annular carbon atoms, a straight chain, An aryl group with 6-30 carbon atoms which are not replaced [an alkoxy group with branching or 1-20 annular carbon atoms, substitution or], An arylamino group with 6-30 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with an aryl alkylamino group with 7-30 carbon atoms which are not replaced [an alkylamino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution, or], substitution, or 8-30 unreplaced carbon atoms, An adjoining substituent and X^1 - X^{20} may form cyclic structure unitedly. A substituent may be the same when the adjoining substituent is an aryl group.]
General formula[1]-[16]When a compound of a formula contains an amino group or an alkenyl group, it is preferred.
[0027]
[Formula 8]



[17]

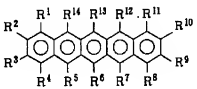


[18]

[0028][General formula [17]-[18]Independently R^1 - R^4 among a formula, respectively An alkyl group with 1-20 carbon atoms, It is an aryl group with 6-30 carbon atoms which are not replaced [substitution or], and R^1, R^2 and/or R^3, and R^4 may be combined via carbon-carbon bonding or -O-, and -S-. R^5 - R^{16} A hydrogen atom, a straight chain, branching, or an alkyl group with 1-20 annular carbon atoms, An aryl group with 6-30 carbon atoms which are not replaced [an alkoxy group with a straight chain, branching, or 1-20 annular carbon atoms, substitution, or], An arylamino group with 6-30 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with an aryl alkylamino group with 7-30 carbon atoms which are not replaced [an alkylamino group with 1-30 carbon atoms which are not replaced / substitution or /, substitution, or], substitution, or 8-30 unreplaced carbon atoms, An adjoining substituent and R^5 - R^{16} may form cyclic structure unitedly. It is desirable when at least one of substituent R^5 in each formula - the R^{16} contains amine or an alkenyl group.]

[0029]As a fluorescent compound which is used by this invention and which has at least one pentacene skeleton, it is a following general formula, for example. [19]-A compound shown by [20] is mentioned.

[Formula 9]



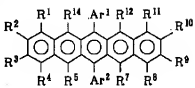
[19]

[General formula [19]Inside R^1 - R^{14} independently, respectively A hydrogen atom, An alkyl group with 1-10 carbon atoms, an aryloxy group with 6-20 carbon atoms, It is an arylated alkyl group with 6-20 carbon atoms, an aryl group with 6-30 carbon atoms, an arylamino group with 6-30 carbon atoms, an alkylamino group with 2-20 carbon atoms, or an aryl alkylamino group with 6-30 carbon atoms, and may be replaced. At least 1 set which R^1 - R^{14} furthermore adjoin mutually is except a hydrogen

atom, and forms cyclic structure.]

[0030]

[Formula 10]



[20]

[General formula [20]Inside R^{15} - R^{26} independently, respectively A hydrogen atom, An alkyl group with 1-10 carbon atoms, an aryloxy group with 6-20 carbon atoms, It is an arylated alkyl group with 6-20 carbon atoms, an aryl group with 6-30 carbon atoms, an arylamino group with 6-30 carbon atoms, an alkylamino group with 2-20 carbon atoms, or an aryl alkylamino group with 6-30 carbon atoms, and may be replaced. At least 1 set which R^{15} - R^{26} furthermore adjoin mutually is except a hydrogen atom, and forms cyclic structure. Ar^1 and Ar^2 are heterocycle groups with 5-30 carbon atoms which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or].]

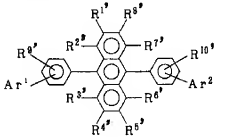
[0031]As for a fluorescent compound which has a fluoranthene skeleton or a perylene skeleton, in order efficient and to acquire a long life, it is preferred to contain an electron releasing group, and a desirable electron releasing group is an arylamino group which is not replaced [substitution or]. As for a fluorescent compound which has a fluoranthene skeleton, a perylene skeleton, or a pentacene skeleton, five or more are preferred in the number of condensed rings, and six especially or more are preferred. This is because a fluorescent compound shows fluorescence peak wavelength of 540-650 nm, luminescence from a fluorescent compound laps with a blue system luminescent material and it assumes white. When said fluorescent compound carries out two or more owners of a fluoranthene skeleton or the perylene skeleton, since the luminescent color serves as a red spectrum region from yellow, it is preferred. Especially a desirable fluorescent compound has an electron releasing group, a fluoranthene skeleton, or a perylene skeleton, and shows fluorescence peak wavelength of 540-650 nm.

[0032]As for said blue system luminescent material used by this invention, it is preferred that they are a styryl derivative, an anthracene derivative, or aromatic amine. It is preferred that said styryl derivative is at least one kind chosen from a JISUCHIRIRU derivative, a tris CHIRIRU derivative, a tetra styryl derivative, and a styryl amine derivative. It is preferred that said anthracene derivative is a compound which has a phenylanthracene skeleton. It is preferred that said aromatic amine is a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out. This aromatic amine is still more preferred in it being a compound which has 2-4 nitrogen atoms by which aromatic substitution was carried out, and has at least one alkenyl group.

[0033]As the above-mentioned styryl derivative and an anthracene derivative, it is a following general formula, for example. [i]-[v] A compound shown is a following general formula as the above-

mentioned aromatic amine, for example. [vi]-[vii] A compound shown is mentioned. General formula[i]

[Formula 11]

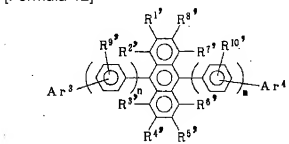


[i]

[0034][$R^{1'}$ - $R^{10'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^1 and Ar^2 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 7-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or].]

[0035]General formula[ii]

[Formula 12]

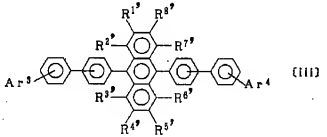


[ii]

[0036][$R^{1'}$ - $R^{10'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^3 and Ar^4 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 7-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with 4-40 carbon atoms which are not replaced [a heterocycle group with 5-30 carbon atoms which are not replaced / a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or /, substitution, or]. 1-3m of n are 1-3, and n+m>=2.]

[0037]General formula[iii]

[Formula 13]



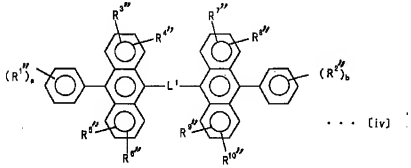
(III)

[0038][$R^{1'}$ - $R^{8'}$ among a formula, Independently, respectively An alkyl group with 1-20 carbon atoms which are not replaced [a hydrogen atom a halogen atom, a cyano group, a nitro group, substitution, or], An aryloxy group with 6-30 carbon atoms which are not replaced [an alkoxy group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An arylthio group with 6-30 carbon atoms which are not replaced [an alkylthio group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], It is a heterocycle group with 5-30 carbon atoms which are not replaced [a condensed multi-ring group with 10-30 carbon atoms which are not replaced / an arylated alkyl group with 7-30 carbon atoms which are not replaced / substitution or /, a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or]. Independently, Ar^3 and

Ar^4 are alkenyl groups which are not replaced [an aryl group with 6-30 carbon atoms which are not replaced / substitution or /, substitution, or], and, respectively as a substituent, An alkoxy group with 1-20 carbon atoms which are not replaced [an alkyl group with 1-20 carbon atoms which are not replaced / substitution or /, substitution or], An alkylthio group with 1-20 carbon atoms which are not replaced [an aryloxy group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], An arylated alkyl group with 6-30 carbon atoms which are not replaced [an arylthio group with 6-30 carbon atoms which are not replaced / substitution or /, substitution or], It is an alkenyl group with 4-40 carbon atoms which are not replaced [a heterocycle group with 5-30 carbon atoms which are not replaced / a condensed multi-ring group with 10-30 carbon atoms which are not replaced / a monocycle group with 5-30 unreplaced carbon atoms, substitution, or /, substitution, or /, substitution, or].]

[0039]General formula[iv]

[Formula 14]

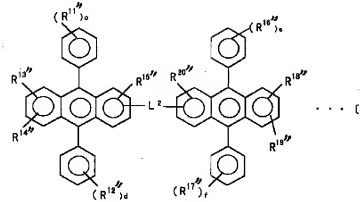


... (iv)

[0040][R^{1}"- R^{10}" among a formula, A hydrogen atom, an alkenyl group, an alkyl group, a cycloalkyl group, the aryl group that may be replaced, an alkoxyl group, an aryloxy group, an alkylamino group, an arylamino group, or the heterocyclic group that may be replaced is shown independently, respectively, a and b show the integer of 1-5, respectively, and when they are two or more, R^{1}"comrades or R^{2}". In each, it may be the same or may differ, and R^{1}"comrades or R^{2}" may join together, may form the ring, and, R^{3} -- ", R^{4}", and R^{5} -- ", R^{6}", and R^{7} -- ", R^{8}", and R^{9}"and R^{10}" may combine with it being, and may form the ring. L^{1} shows a single bond or -O-, -S-, -N(R)- (R is an alkyl group or an aryl group which may be replaced), or an allylene group. The anthracene derivative expressed with], or a general formula [v]

[0041]

[Formula 15]



[0042][R^{11}"- R^{20}" among a formula, A hydrogen atom, an alkenyl group, an alkyl group, a cycloalkyl group, an aryl group, an alkoxyl group, an aryloxy group, an alkylamino group, an arylamino group, or two or more cyclic group that may be replaced is shown independently, respectively, In [when c, d, e, and f show the integer of 1-5, respectively and they are two or more] each R^{11}"comrades and R^{12}' comrades and R^{16}' comrades or R^{17}", It may be the same or may differ, and R^{11}"comrades and R^{12}' comrades and R^{16}' comrades or R^{17}" may join together, may form the ring, and, R^{13}", R^{14}", and R^{18}"and R^{19}" may combine with it being, and may form the ring. L^2 shows a single bond or -O-, -S-, -N(R)- (R is an alkyl group or an aryl group which may be replaced), or an allylene group.]

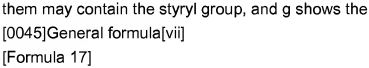
[0043]General formula[vi]

[Formula 16]

[0044][Ar^3', Ar^4', and Ar^5' show independently the aromatic group of the monovalence which is not replaced [substitution with 6-40 carbon atoms, or] among a formula, respectively, at least one in them may contain the styryl group, and g shows the integer of 1-4.]

[0045]General formula[vii]

[Formula 17]

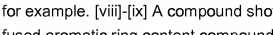


[0046][-- a formula -- inside -- Ar -- ^{6} -- ' -- Ar -- ^{7} -- ' -- Ar -- ^{9} -- ' -- Ar -- ^{11} -- ' -- and -- Ar -- ^{12} -- '. The aromatic group of the monovalence which is not replaced [substitution with 6-40 carbon atoms or] is shown independently, respectively, and Ar^8' and Ar^{10}' The aromatic group of the bivalence which is not replaced [substitution with 6-40 carbon atoms or] is shown independently, respectively, at least one of A^6' - the Ar^{12}' may contain the styryl group or the Styr Wren group, and h and k are the integers of 0-2, respectively.]

[0047]It is preferred that said blue fluorescence dopant is at least one kind chosen from styryl amine, an amine substitution styryl compound, and a fused aromatic ring content compound. As the above-mentioned styryl amine and an amine substitution styryl compound, it is a following general formula, for example. [viii]-[ix] A compound shown is a following general formula as the above-mentioned fused aromatic ring content compound, for example. [x] A compound shown is mentioned.

[0048]General formula[viii]

[Formula 18]



[0049]the inside of [type, and Ar^1 -- ", Ar^2", and Ar^3" show independently the aromatic group which is not replaced [substitution with 6-40 carbon atoms or], respectively, and, as for at least one in them, n shows the integer of 1-3 including a styryl group.]

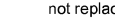
[0050]General formula[ix]

[Formula 19]

[0051][Ar^4"and Ar^5" among a formula, Independently, an allylene group, E^1, and E^2 with 6-30 carbon atoms show an aryl group or an alkyl group, a hydrogen atom, or a cyano group with 6-30 carbon atoms independently, respectively, and q shows an integer of 1-3, respectively. U and/or V are the substituents containing an amino group, and are preferred in this amino group being an arylamino group.]

[0052]General formula[x]

[Formula 20]



[0053][A among a formula An alkyl group or an alkoxy group with 1-16 carbon atoms, The arylamino group which is not replaced [substitution with the alkylamino group which is not replaced / substitution with the aryl group which is not replaced / substitution with 6-30 carbon atoms or / and 6-30 carbon atoms or / or 6-30 carbon atoms or] and B show a fused aromatic ring group with 10-40 carbon atoms, and r shows the integer of 1-4.]

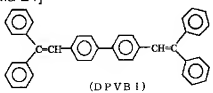
[Translation done.]

* NOTICES *

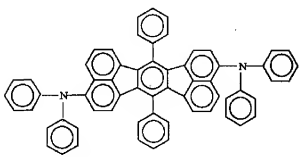
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example]Next, although an example explains this invention still in detail, this invention is not limited at all by these examples.
Production of example 1 organic EL device (the first example of composition: fluoranthene skeleton) glass substrate with an ITO (In-Sn-O) transparent electrode (made by a JIOMA tick company) of 75 mm x 25 mmx1.1-mm thickness UV ozone wash after performing ultrasonic cleaning for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of a vacuum evaporator is equipped with the glass substrate with a transparent electrode line after washing, On the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, the N,N'-bis(N,N'-diphenyl-4-aminophenyl)-N,N-diphenyl-4,4'-diamino-1,1'-biphenyl film (TPD232 film) of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, it is a 4,4'-screw [N-(1-naphthyl) -N-phenylamino] of 20 nm of thickness on TPD232 film. The biphenyl film (NPD film) was formed. This NPD film functions as an electron hole transporting bed. They are the styryl derivative DPVBi of 40 nm of thickness, and the following fluorescent compound (E1, fluorescence-peak wavelength: 565 nm) on a NPD film.
[0055]
[Formula 21]



(DPVBi)



(E1)

[0056]Membranes were vapor-deposited and formed by the weight ratio of 40:0.04. This film functions as a white light layer. It is tris (eight quinolinol) of 20 nm of thickness on this film. The aluminum film (Alq film) was formed. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 181 cd/m^2, maximum light-emitting-luminance 110000 cd/m^2, and luminous efficiency 8.8 cd/A was obtained. It is also as a chromaticity coordinate (0.36-0.32), and has checked with white light. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1800 hours.

[0057]Production of example 2 organic EL device (the second example of composition: fluoranthene skeleton)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. At this time, the above-mentioned fluorescent compound (E1) was simultaneously produced by the weight ratio of 20:0.1. This NPD film functions as a luminous layer of the yellow-orange color of electron hole transportability. DPVBi of 40 nm of thickness was produced as a blue light layer, and the Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 151 cd/m^2, maximum light-emitting-luminance 80000 cd/m^2, and luminous efficiency 6.8 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1100 hours.

[0058]Production of example 3 organic EL device (the third example of composition: fluoranthene skeleton)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent

electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. This NPD film functions as an electron hole transporting bed. On the NPD film, the above-mentioned fluorescent compound (E1) of 3 nm of thickness was vapor-deposited, and membranes were formed. This film functions as a fluorescent compound layer, and emits light in orange. On this film, the styryl derivative DPVBi of 40 nm of thickness was vapor-deposited, and membranes were formed. This film functions as a blue light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was impressed, the white light of light-emitting-luminance 131 cd/m^2, maximum light-emitting-luminance 60000 cd/m^2, and luminous efficiency 5.8 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 1400 hours.

[0059]Production of example 4 organic EL device (example which added the hole transporting material to the luminous layer)

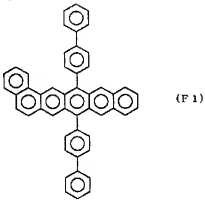
UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. This NPD film functions as an electron hole transporting bed. Mixed vacuum evaporation of the styryl derivative DPVBi was carried out by the weight ratio of 20:20:0.04 as NPD and a blue light material as the above-mentioned fluorescent compound (E1) and a hole transporting material, and the film was produced. This film functions as a white light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5V was

impressed, the white light of light-emitting-luminance 131 cd/m^2, maximum light-emitting-luminance 120000 cd/m^2, and luminous efficiency 8.0 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 2000 hours.

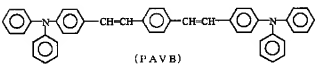
[0060]Production of example 5 organic EL device (the first example of composition: pentacene skeleton)

In Example 1, they are the following PAVB and the following fluorescent compound (F1, fluorescence-peak wavelength: 595 nm) on a NPD film as the styryl derivative DPVBi of 40 nm of thickness, and a blue fluorescence dopant.

[Formula 22]



(F 1)



(P A V B)

[0061]Except for having vapor-deposited and formed membranes by the weight ratio of 40:1:0.05, the organic EL device was formed similarly. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 6V was impressed, the white light of light-emitting-luminance 319 cd/m^2, maximum light-emitting-luminance 100000 cd/m^2, and luminous efficiency 7.28 cd/A was obtained. It is also as a chromaticity coordinate (0.33-0.34), and has checked with white light. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was very as long-life as 3500 hours.

[0062]Production of example 6 organic EL device (the second example of composition: pentacene skeleton)

UV ozone wash after performing ultrasonic cleaning for the glass substrate with an ITO transparent electrode of 75 mm x 25 mmx1.1-mm thickness (made by a JIOMA tick company) for 5 minutes in isopropyl alcohol -- a 30-minute question -- it carried out. The substrate holder of the vacuum evaporator was equipped with the glass substrate with a transparent electrode line after washing, and on the field of the side in which the transparent electrode line is formed first, as said transparent electrode was covered, TPD232 film of 60 nm of thickness was formed. This TPD232 film functions

as a hole injection layer. Next, the NPD film of 20 nm of thickness was formed on the TPD232 film. On this NPD film, the styryl derivative DPVBi of 2 nm of thickness and the fluorescent compound (F1) were vapor-deposited by the weight ratio of 2:0.026, and membranes were formed. This film functions as an orange-light-emitting layer. On this film, PAVB was vapor-deposited by the weight ratio of 38:1 as the styryl derivative DPVBi of 38 nm of thickness, and a blue fluorescence dopant, and membranes were formed. This film functions as a blue light layer. The Alq film of 20 nm of thickness was formed on this film. This Alq film functions as an electronic injection layer. then, Li (Li: made by a SAESU getter company) and Alq -- duality -- making it vapor-deposit -- electronic injection layer (negative pole) ****** -- the Alq:Li film was formed. On this Alq:Li film, metal aluminum was made to vapor-deposit, metal cathode was formed, and the organic EL device was formed. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 5.5V was impressed, the white light of light-emitting-luminance 233 cd/m^2, maximum light-emitting-luminance 80000 cd/m^2, and luminous efficiency 6.85 cd/A was obtained. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as long-life as 2100 hours.

[0063]In comparative example 1 Example 1, the organic EL device was similarly formed instead of the fluorescent compound (E1) except for having used conventionally the rubrene used as an orange fluorescent compound. The performance was evaluated about the obtained organic EL device. When aluminum negative pole was made the anode for the ITO anode with the negative electrode and the direct current voltage 6V was impressed, the white light of light-emitting-luminance 140 cd/m^2, maximum light-emitting-luminance 60000 cd/m^2, and luminous efficiency 4.0 cd/A was obtained. Thus, compared with the example, luminous efficiency was substantially inferior. When the constant voltage drive of this element was carried out by initial luminance 1000 cd/m^2, it was as short-life as 560 hours.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure showing the example of 1 composition of the white system organic electroluminescence element of this invention.
[Drawing 2]It is a figure showing another example of 1 composition of the white system organic electroluminescence element of this invention.
[Drawing 3]It is a figure showing another example of 1 composition of the white system organic electroluminescence element of this invention.
[Drawing 4]It is a figure showing another example of 1 composition of the white system organic electroluminescence element of this invention.

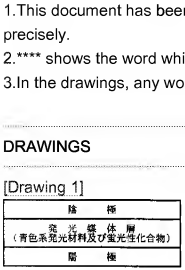
[Translation done.]

* NOTICES *

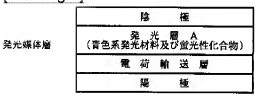
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

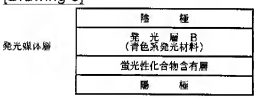
[Drawing 1]



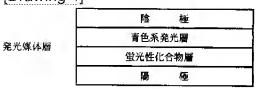
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]